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(21) International Application Number: PCT/SE97/00859 (22) International Filing Date: 26 May 1997 (26.05.97) (30) Priority Data: 9602345-2 14 June 1996 (14.06.96) SE (71) Applicant (for all designated States except US): AKTIEBO- LAGET ELECTROLUX [SE/SE]; S-105 45 Stockholm (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): CASTWALL, Lennart [SE/SE]; Åkerbyvägen 82, S-183 35 Täby (SE). SVED- BERG, Johan [SE/SE]; Hjälmegatan 10, S-112 29 Stockholm (SE). (74) Agents: ERIXON, Bo et al.; AB Electrolux, Group Patents & Trademarks, S-105 45 Stockholm (SE).		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
(54) Title: VACUUM CLEANER SYSTEM (57) Abstract <p>A vacuum cleaner system having a hand-held unit (10), a vacuum cleaner nozzle (14) connected to the hand-held unit (10), a suction hose (16) extending from the hand-held unit (10), and a vacuum source (18) provided at the end of the suction hose (16) which is remote from the hand-held unit. The end of the suction hose is connected to an air cleaner (20). The air cleaner (20) is provided with means (23, 24) for alternatively or commonly cleaning the ambient air and/or the air from the suction hose (16).</p>		

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VACUUM CLEANER SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to a vacuum cleaner system comprising a hand-held unit, a vacuum cleaner nozzle connected to the hand-held unit, a suction hose extending from the hand-held unit, and a vacuum source. The vacuum source is provided
5 at an end of the suction hose which is remote from the hand-held unit, and the end of the suction hose is connected to an air cleaner.

Hand-held vacuum cleaners comprising a vacuum source and a dust container are known in the art. In order to connect the
10 hand-held unit to the mains supply, there is a power cable extending from the unit. According to a more sophisticated device, such as taught by WO 94/15518, a vacuum cleaner of the above type is provided with a cord reel designed as a separate unit. The cord reel unit preferably is placed close to the mains
15 socket, and the cable between the cord reel and the hand-held unit is fed out from or drawn into the cord reel unit by means of remote control from the hand-held unit. A disadvantage with this type of hand-held vacuum cleaner is the relatively high weight of the hand-held unit. Even if the electric motor in the
20 unit is extraordinarily compact and has been designed to be as low weight as possible, the existence of the motor within the hand-held unit means a relatively increased weight compared to ordinary tube handles.

SUMMARY OF THE INVENTION

25 An object of the present invention is to provide a vacuum cleaner system which includes a hand-held unit having a reduced weight compared to prior hand-held systems mentioned above and simultaneously achieve ultra-cleaning of the air exiting the vacuum cleaner.

In accordance with the present invention, a vacuum cleaner system has a hand-held unit, a vacuum cleaner nozzle, a suction hose, a vacuum source and an air cleaner. The vacuum cleaner nozzle is connected to the hand-held unit. The suction hose
5 extends between the hand-held unit and the vacuum source.

In further accordance with the present invention, an end of the suction hose connected to the air cleaner includes means for cleaning air communicated through the suction hose. Preferably, the air cleaner is downstream of the suction hose and includes
10 an electrostatic filter.

In further accordance with the present invention, the air cleaner includes a fan to create air flow through the air cleaner. The suction hose is wound upon a hose reel and the hose reel is rotatably arranged in the air cleaner. A force
15 accumulating means is associated with the hose reel and assists in rotating the hose reel when the suction hose is wound up.

BRIEF DESCRIPTION OF THE DRAWINGS

These and further features of the present invention will be apparent with reference to the accompanying drawings, wherein:

20 FIG. 1 schematically shows a hand-held vacuum cleaner system according to the present invention;

FIG. 2 is an alternative embodiment according to the present invention;

25 FIG. 3 is an alternative embodiment of an air cleaner which is a part of the system; and

FIG. 4 shows an alternative embodiment of the system according to the invention including the air cleaner of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 With reference to FIG. 1, the system according to the present invention comprises a hand-held unit 10, an inlet tube 12 having a lower end with a nozzle 14, a suction hose 16, a suction arrangement 18, such as a fan unit driven by an electric

motor, and a separate air cleaner 20. The air cleaner 20 preferably includes an electrostatic filter.

The air cleaner 20 is normally arranged to clean the air in the room. The invention is, however, not limited to the use of
5 an air cleaner comprising an electrostatic filter. HEPA-filters, ULPA-filters, microfilters and other types of filters could be used in place of, or in addition too, an electrostatic filter. The air cleaner 20 is provided with means, for instance a sleeve 21, to connect to the suction hose 16 to the air cleaner 20.

10 In the embodiment shown in FIG. 1, the suction arrangement 18 is connected to the suction hose 16 near the end of the suction hose 16 which is connected to the air cleaner 20. In the embodiment shown in FIG. 2, the suction arrangement 18 is placed within the air cleaner 20, and the air cleaner 20 has a sleeve
15 21 to connect the suction hose 16 to the air cleaner.

The hand-held unit 10 comprises conventional coupling or joint means (not shown) to connect the suction tube 12 and the suction hose 16 to the hand-held unit. The hand-held unit preferably includes a handle 22 or the like, and the handle 22
20 is provided with control means for operating different functions of the system, particularly the motor of the suction arrangement 18, 18'. The mains connection of the motor of the suction arrangement 18, 18' is made either directly to a mains socket, or via the air cleaner 20, 20'.

25 As indicated in FIGS. 1 and 2, the air cleaner 20 and 20' respectively, is provided with a filter unit 23 and a fan 24. During normal operating conditions of the air cleaner 20, 20', that is, when the suction hose 16, 16' is not connected to the air cleaner 20, 20', air is drawn from beneath, see the arrow 26,
30 and is expelled at the top of the air cleaner, see the arrow 28. The filter unit 23 is preferably of the electrostatic type, but a HEPA-filter, a microfilter, an ULPA-filter or the like could also be used, either alone or in combination. An advantage in using an electrostatic filter comprising electrostatically-
35 charged plates between which the air flows is that there is almost no pressure drop over the filter, and the electrostatic filter does not necessarily impede air flow.

The vacuum cleaner system according to the invention operates in the following way. When the system is to be used, the suction tube 12 and one end of the suction hose 16, 16' are connected to the hand-held unit 10. Then the second end of the suction hose 16, 16' is connected to the air cleaner 20 or 20', respectively. The motor of the suction arrangement 18, 18' is started by means of a remote control switch on the handle 22 of the hand-held unit 10. Dust and other particles drawn from the surface flow through the suction tube 12 and enter the hand-held unit 10 in which the dust and other particles are separated or filtered in the dust container or dust bag. The filtered air exiting the dust container continues through the hand-held unit 10 and flows through the suction hose 16, 16' and into the suction arrangement 18, 18'. Thus, from the air entering into the suction arrangement 18, 18', comparatively large particles have been separated or removed by the dust bag. Further cleaning of the air can also be made by additional filters (not shown) placed after the dust bag in the hand-held unit 10.

The air flowing through the suction arrangement 18, 18' is distributed or introduced into the air cleaner 20, 20'. In the air cleaner, the air flowing from the suction hose 16, 16' is mixed with ambient air 26 drawn in from beneath or outside of the air cleaner 20, 20'. The mixture of filtered and ambient air is then cleaned in the air cleaner 20, 20', for instance, by means of electrostatic action, after which the cleaned mixture 28 is expelled from the air cleaner 20, 20'.

The air cleaner 20" shown in FIGS. 3 and 4 mainly corresponds to the air cleaner 20 and 20', but the filter unit and fan are not shown in FIGS. 3 and 4. The air cleaner 20" is provided with a hose reel 30", preferably designed as a drum. The hose reel 30" has a central shaft 32" and is turnably arranged on the shaft. In FIG. 3, the suction hose 16" is wound on the hose reel 30", and the free end of the suction hose 16" is hanging down from the hose reel 30". The opposite end (not shown) of the suction hose 16" at the central part of the hose reel 30" extends into the interior of the air cleaner 20" in order to be connected to a suction arrangement (not shown). It

is considered apparent to one skilled in the art that the hose 16" is connected to the suction arrangement, as shown in FIGS. 1-2.

FIG. 4 shows the function of a vacuum cleaner system according to the invention with the air cleaner 20" being provided with the hose reel 30". According to this embodiment, the free end of the suction hose 16" is connected to the hand-held unit 10, corresponding to the hand-held unit in FIG. 1. In order to vacuum all parts of the rooms, the suction hose 16" is unwound from the hose reel 30", which means that the hose reel 30" rotates about its central shaft 32" during said winding operation. It is possible that the unwinding operation of the suction hose 16" takes place with some resistance, for instance, by tensioning a spring during the unwinding operation. The tensioned spring will then cause the suction hose 16" to be again wound up on the hose reel 30" when the suction hose 16" is released from the hand-held unit 10. Alternatively, it is possible to use an arrangement wherein unwinding and winding of the suction hose 16" on the hose reel 30" is effected by a motor rotating the hose reel 30" about its central shaft 32". Thus, the rotation of the hose reel 30" is controlled by a remote control arranged on the hand-held unit.

By means of the vacuum cleaner system described above, an extremely clean outlet air is achieved from the vacuum cleaner since the outlet air passes through an air cleaner 20, 20', i.e., the air coming from ambient to the air cleaner 20, 20', as well as the air delivered from the suction hose 16 to the air cleaner 20, 20', are commonly cleaned in the same way in the air cleaner 20, 20'. Thus, even if vacuum cleaning takes place, the air quality in the space is not deteriorated since all air passes the air cleaner 20, 20' before it is expelled into the ambient.

In order to get the vacuum cleaner system to operate properly, the suction hose 16, 16', 16" which is used should be provided with a smooth inner surface, which means that the friction losses for the air flowing in the hose 16, 16', 16" is as small as possible. This makes it possible to use a longer hose 16.

Since the suction arrangement 18, 18', according to the invention, has been moved away from the hand-held unit 10, it is very easy to handle the hand-held unit because of its small weight.

5 It should be mentioned that as an alternative, the air cleaner could be provided with an arrangement closing the inlet side of the air cleaner during the vacuum cleaning operation, thereby allowing solely air from the vacuum cleaner to flow through the air cleaner.

10 While the preferred embodiments of the invention are shown and described herein, it is to be understood that the invention is not so limited, but rather shall cover and include any and all modifications which fall within the purview of the invention as defined by the claims appended hereto.

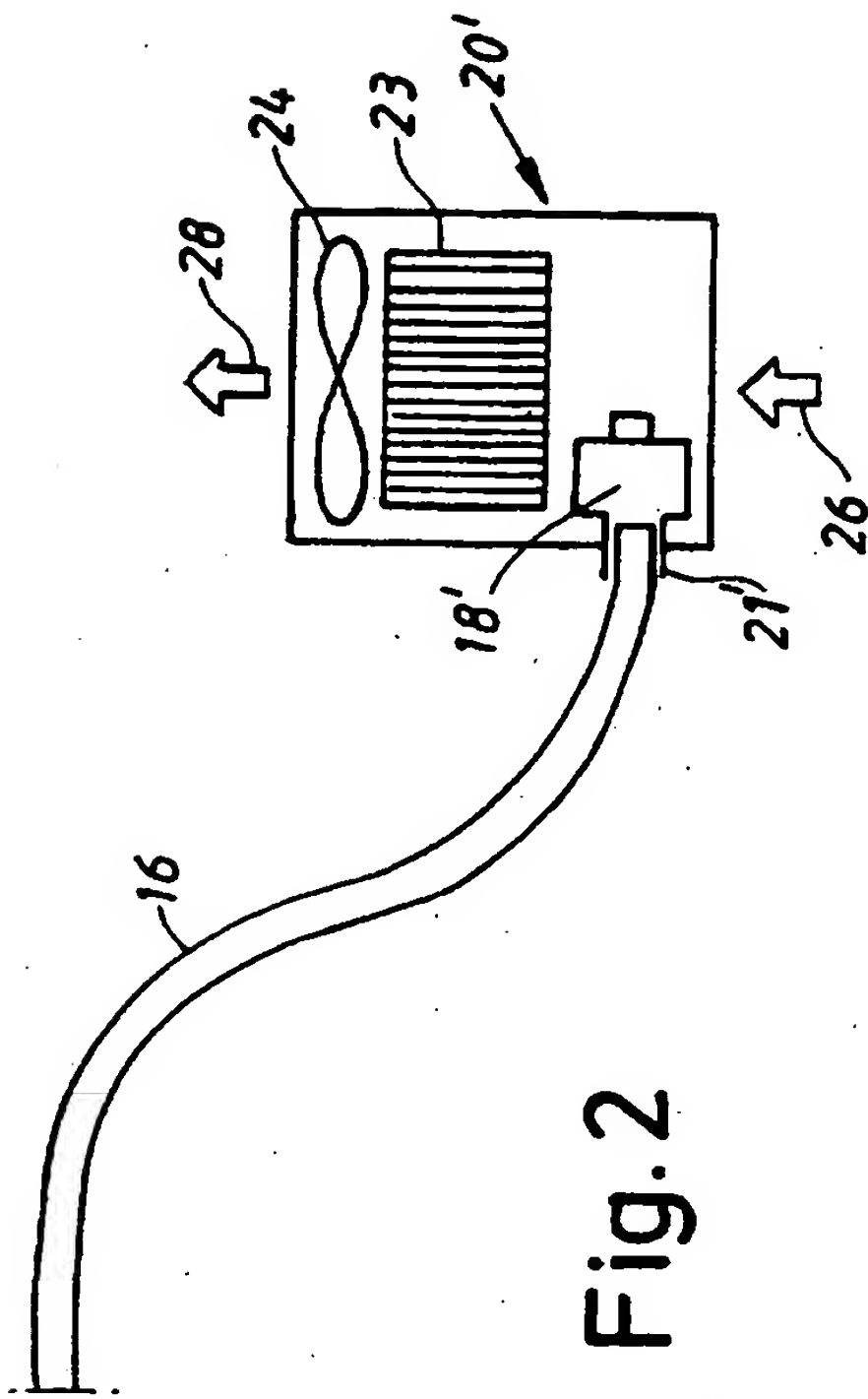
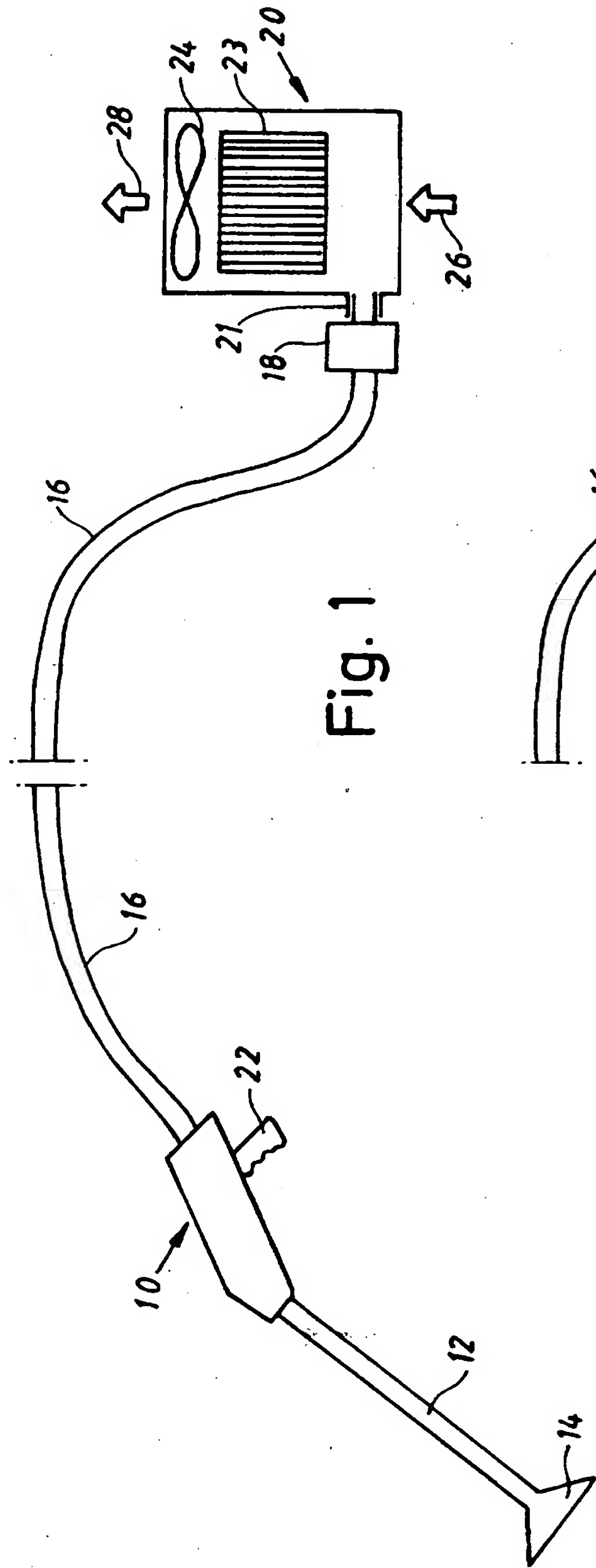
CLAIMS

1. Vacuum cleaner system comprising a hand-held unit (10), a vacuum cleaner nozzle (14), a suction hose (16, 16', 16"), a vacuum source (18, 18'), and an air cleaner (20, 20', 20"), said vacuum cleaner nozzle (14) being connected to said hand-held unit
5 (10), said suction hose (16, 16', 16") having a first end connected to said hand-held unit (10) and a second end connected to said air cleaner (20, 20', 20"), said vacuum source (18, 18') being disposed near said suction hose second end and remote from said hand-held unit (10), characterized in that the air cleaner
10 (20, 20', 20") is provided with means (23, 24) for alternatively or commonly cleaning the air from the ambient and/or the air from the suction hose (16, 16").
2. Vacuum cleaner system according to claim 1 characterized in that the air cleaner (20, 20') comprises an electrostatic filter.
- 15 3. Vacuum cleaner according to claim 1 or 2 characterized in that the air cleaner (20, 20') is provided with a fan (24) said fan creating a flow of air through the air cleaner (20, 20').
4. Vacuum cleaner system according to any of the preceding claims characterized in that the vacuum source (18) is integrated
20 into the suction hose (16).
5. Vacuum cleaner system according to any of claims 1-3 characterized in that the vacuum source (18') is integrated into the air cleaner (20').
6. Vacuum cleaner system according to any of the preceding
25 claims characterized in that the suction hose (16") in a non operating position is wound on a hose reel (30").
7. Vacuum cleaner system according to claim 6 or 7 characterized in that the hose reel (30") is rotatably arranged in the air cleaner (20").
- 30 8. Vacuum cleaner system according to claim 6 characterized in that a force accumulating means, for instance a spring, is associated with the hose reel (30"), such that force is accumulated when the suction hose (16") is unwound from the reel

and the force accumulating means assists in rotating rotating the hose reel (30") when the suction hose (16") is wound up on the reel.

9. Vacuum cleaner system according to any of claims 6-8
5 **characterized in** that it further comprises an electric motor operable to rotate the the hose reel (30), said electric motor being remotely controlled from the hand held unit (10).

10. Vacuum cleaner system according to any of the preceding claims **characterized in** that said hand-held unit (10) includes
10 a filter to remove dirt and particles from an air stream drawn through the nozzle (14) and thereby supply filtered air to said suction tube.



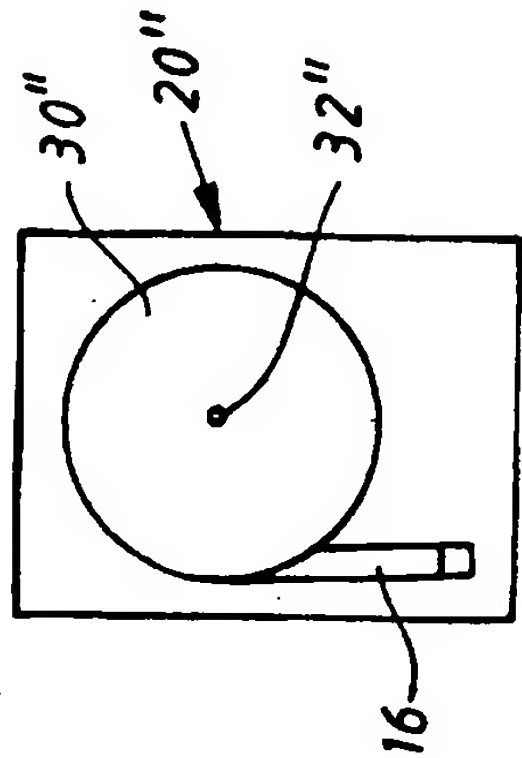


Fig. 3

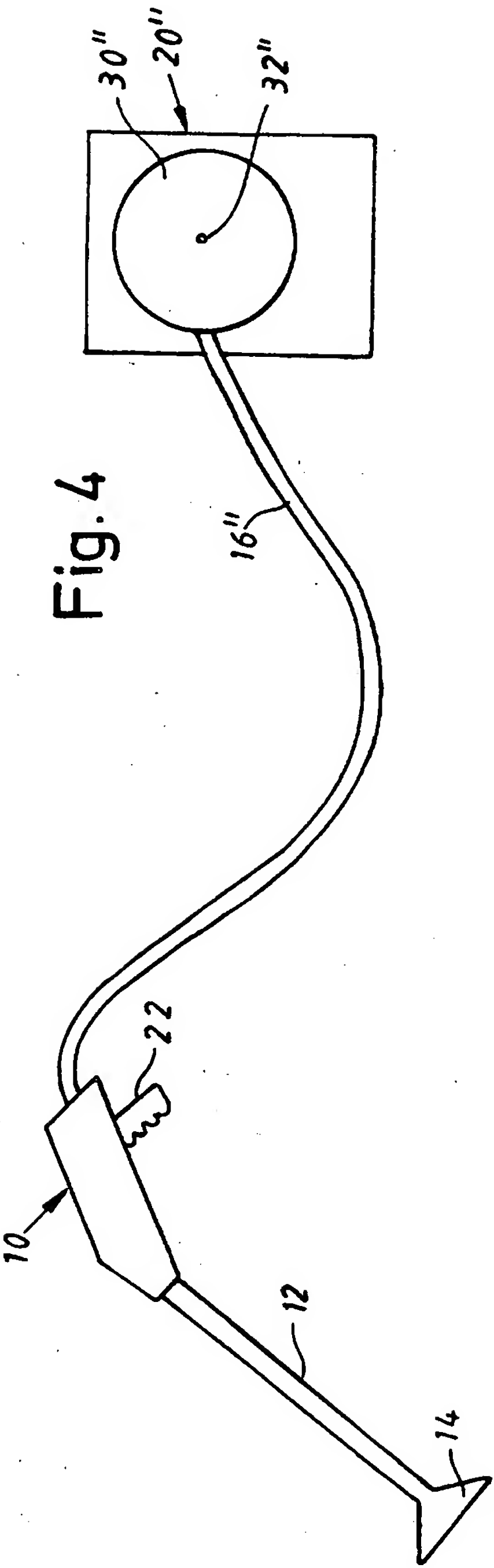


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00859

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A47L 5/24, A47L 7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 1187771 A (LICENTIA PATENT-VERWALTUNGS-G.M.B.H.), 25 February 1965 (25.02.65), figures 1,2 ---	1,6
A	US 5481780 A (DANESHVAR), 9 January 1996 (09.01.96), figure 2, abstract -----	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 1187771 A	25/02/65	NONE	
US 5481780 A	09/01/96	NONE	